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FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER ENGINEERING

COURSE: CEF 440 - Internet Programming and Mobile Programming

TASK2: REQUIREMENT GATHERING of the biometric student's attendance app

Presented by

GROUP 5

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ABSTRACT

This report focuses on the development of a biometric student attendance application. The aim is to streamline the attendance tracking process in educational institutions by leveraging biometric technology, specifically fingerprint recognition. The project involves gathering requirements which has been achieved through surveys, interviews, and brainstorming sessions with students and lecturers. The identified requirements guide the development process, ensuring a user-friendly mobile application that integrates advanced fingerprint recognition algorithms. The application will simplify attendance tracking, eliminate manual recording, and provide accurate and secure attendance records.

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INTRODUCTION

In today's educational landscape, accurate and efficient attendance tracking is paramount for educational institutions. Conventional methods of attendance taking often prove to be time-consuming and prone to errors. To address this challenge, our project focuses on the development of a user-friendly mobile application for biometric student attendance using fingerprint recognition. The application will streamline the attendance process, eliminate manual recording, and provide accurate and secure attendance records. This report outlines the requirements gathered through surveys, interviews, and brainstorming sessions, focusing on the integration of fingerprint biometrics integration. By leveraging advanced fingerprint recognition algorithms, the mobile application will simplify and improve the efficiency of attendance tracking in educational institutions. The identified requirements will guide the development process, ensuring a solution that is user-friendly, accurate, and adaptable to meet the specific needs of educational institutions, revolutionizing attendance tracking and enhancing the overall educational environment.

In the subsequent sections, we will present the requirements gathered from our thorough analysis and discussions. These requirements will serve as a roadmap for the development process, guiding the design, implementation, and testing phases. By focusing on user-friendliness, accuracy, and adaptability in utilizing fingerprint biometrics, our goal is to create a biometric student's attendance mobile application that revolutionizes attendance tracking and contributes to a more efficient and effective educational environment.

1. Objective and Goal

1.1. OBJECTIVE

The objective of the requirement gathering phase is to identify, record, and rank the essential requirements for creating a user-friendly mobile application for Biometric attendance. Through a thorough approach, we aim to involve stakeholders, comprehend their needs, and convert these insights into actionable requirements. This process will form the basis for the subsequent stages of the project, ensuring that we have a comprehensive understanding of stakeholder expectations, technological needs, and usability factors. Ultimately, our objective is to establish a strong foundation for developing a solution that caters to the varied needs of our target users. The biometric student's attendance mobile application is designed to run as a standalone system. It will interact with the existing student attendance management system, which will include database and backend infrastructures. The mobile application will provide a convenient and secure way for students to mark their attendance using biometric authentication. This project aims to use biometric technology, specifically fingerprint recognition, to create a secure and reliable system for recording student attendance. The mobile application will provide an intuitive interface for both students and instructors, allowing for seamless attendance tracking in classrooms, lecture halls, and other academic settings.

1.2. Goal

This mobile application leverages fingerprint recognition technology to create a secure and reliable system for students to mark their attendance. Students will benefit from a convenient and user-friendly interface, dropping the need for physical attendance sheets. Instructors gain the advantage of real-time attendance tracking, allowing them to watch student participation effectively and identify any discrepancies promptly. The application is designed for scalability and customization, catering to various class sizes and institutional needs. Additionally, the application prioritizes security, employing robust measures to protect student data, particularly sensitive biometric information.

The primary goals of biometric attendance Mobile are as follows:

- Automate the process of recording student attendance using biometric authentication.
- Improve accuracy and reliability by dropping manual entry errors and proxy attendance.
- Provide real-time attendance data for effective monitoring and reporting.

- Enhance security by using biometric identifiers to verify student identity.

2. Understanding the business need

During the requirement gathering phase, various methods and techniques were employed to capture stakeholder's requirements effectively at different stage concerning system requirements, technical requirements and business requirements. These include brainstorming, surveys and interviews.

2.1. Operating environment:

- Mobile Platforms: The application will be developed for popular mobile platforms such as iOS and Android.
- Network Connectivity: The application will require an internet connection for real-time synchronization with the central attendance management system.

2.2 Product features

- Biometric Authentication: The application will use fingerprints as biometric technology for verifying the identity of students.
- Attendance Marking: Students will be able to mark their attendance by scanning their biometric data through the mobile application.
- Real-time Data Synchronization: The attendance data captured through the mobile application will be synchronized in real-time with the central attendance management system.
- Notifications: The application may provide notifications to students about their attendance status, upcoming classes, or any other relevant information.
- User Management: The application will support user management functionalities, including student registration, profile management, and access control.

2.3. Design and implementation constraints:

- Security considerations: The application must adhere to security best practices to ensure the privacy and integrity of biometric data and attendance records.
- Compatibility: The application should be compatible with a range of mobile devices and operating system versions to accommodate a diverse user base.

2.4. User needs and documentation

- Each user will need to register into the system.
- Students will be able to input their fingerprint for registration and associate it to their account.
- Instructors will be able to create different sections/courses for them to track student's attendance, get notifications.
- The admin will be able to manage the entire system.

2.5.Assumptions and dependencies

- Existing Infrastructure: The mobile application assumes the availability of a backend infrastructure, including a database and APIs, to store and retrieve attendance data.
- Biometric Technology Integration: The application depends on the successful integration of biometric authentication technology within the mobile platform.

2.6.User Persona

To understand the need of our target audience, we have developed a user persona describe as follow:

Instructors

Biometric attendance app needs:

- Efficiency: a quick and easy attendance system that would free up valuable class minutes.
- Accuracy: desires a system that eliminates mistakes and ensures accurate data.
- Real-time data: having instant access to attendance information that would help to identify students who are frequently absent and intervene promptly.
- Minimal disruption: the system should be seamless and not disrupt the flow of the lessons.

Challenges faced using the traditional method:

- Time consuming
- Student's write their friend's name
- Missing shift of attendance
- Tired of manually marking attendance and dealing with errors

3. Identify the Stakeholders

Start by finding the key stakeholders who will be affected by the app, including business owners, users, and other decision-makers. Make sure to involve all relevant stakeholders in the requirements gathering process. Giving people a voice in the earliest stages of the project will also help with app adoption at the end of the project.

The key stakeholders involved in the biometric student's attendance app project include:

- Lecturers/instructors: The professors and instructors who need accurate attendance data for academic purposes.
- Students: The end-users who will interact with the biometric system to record their attendance.
- Administrator (HOD): grant lecturers accounts creation.

4. User Research document

The user research methods employed, including brainstorming, surveys and interviews provided valuable insights into the challenges and requirements surrounding the current attendance tracking process. The responses and feedback received from students, teachers and key stakeholders formed the foundation for identifying the key features, user expectations, and system requirements for the development of our biometric student attendance mobile application. Here is what we got:

4.1. Brainstorming Sessions

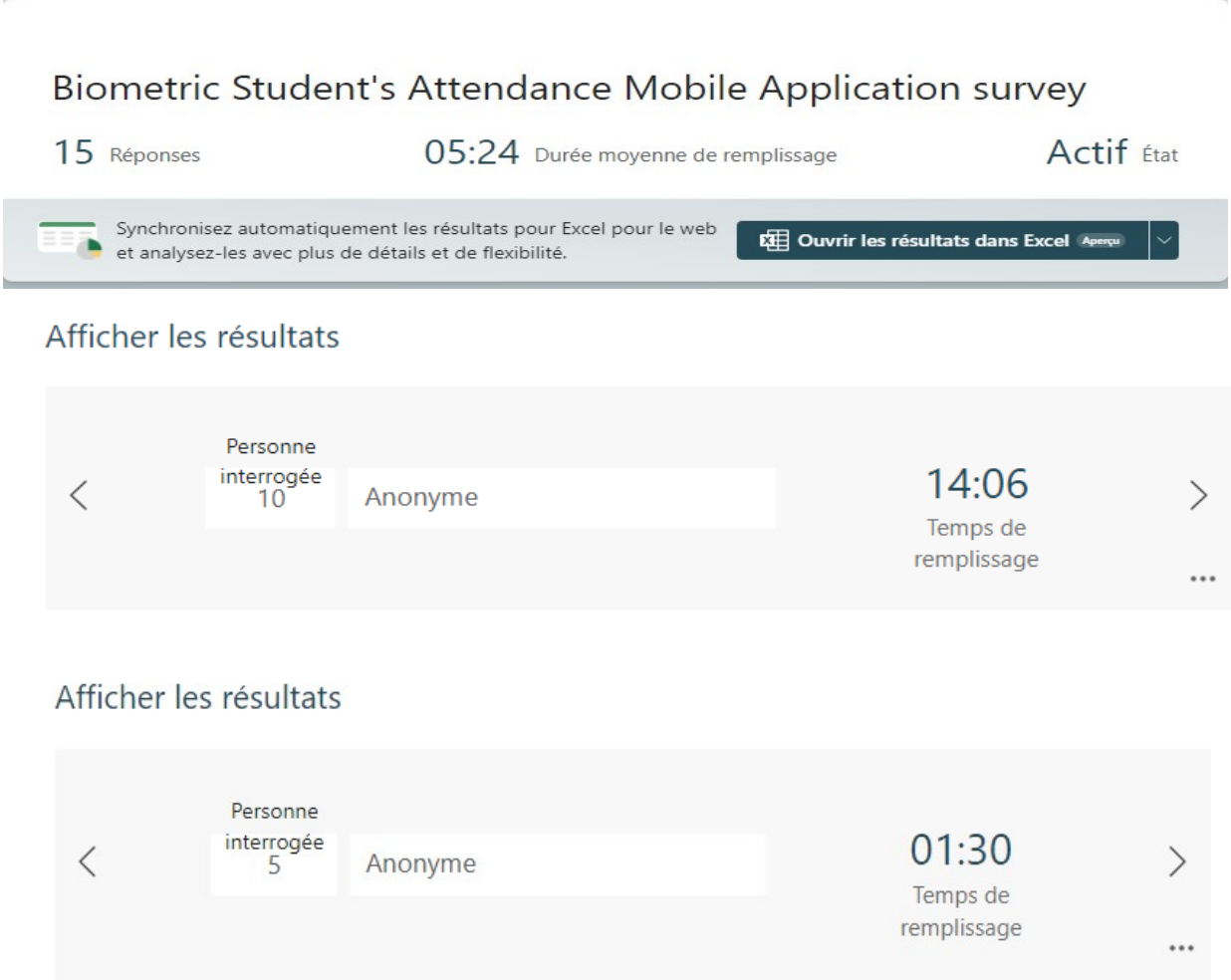
Brainstorming is a collaborative technique that encourages participants to generate ideas and solutions creatively. Throughout the requirement gathering phase, we had discussed with 5 students, and we freely expressed our thoughts and suggestions without judgment. It was basically about what can we see in the application? What do we need to record attendance automatically? What do we need to make it possible? Here is what we got:

- Stakeholders are students, instructors, and administrator (HOD)
- The attendance will be effective and can not take more than 5 seconds per students to record.
- The lecturer will have the privilege to login and create a section (which are classes)
- Student will record their fingerprint.
- Administrator will manage lecturer accounts.

4.2. Surveys

Surveys involve creating questionnaires that are distributed to a target audience to gather feedback and opinions. Surveys can provide quantitative data by asking closed-ended questions concerning what they would like to see if ever the biometric student's app exist, which functionalities they would

like to perform into the app, with predefined answer choices. They are useful for collecting a large amount of information from a wide range of users. We did this using Microsoft forms. The following shows in detail what we got as answers and we noticed that people are very engaged when filling out the form, in average 05:24 minutes to fill the form for 15 answers. Following are screenshots of the result.

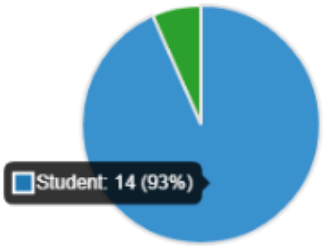


From the survey, answers comes from students, about 93% of students and 7% neither student nor lecturer; and so many faculties and universities: University of buea, university of yaounde

2. **Are you a student or instructor ?**

Plus de détails

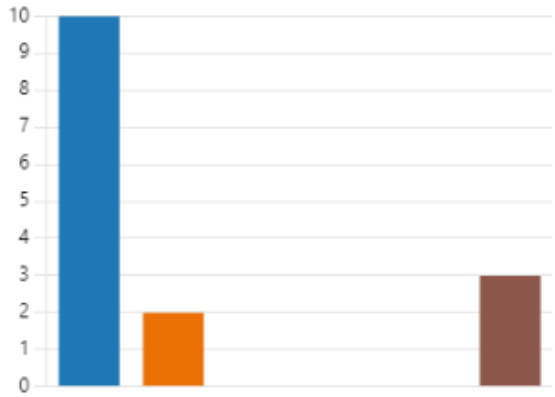
Student	14
Instructor	0
Autre	1



3. **Which University and faculty are you ?**

Plus de détails

University of buea - FET	10
University of buea - COT	2
Universite de Douala - faculte d...	0
universite de Yaounde	0
IUT - Douala	0
Autre	3



Other:

3. Which University and faculty are you ?

15 Réponses

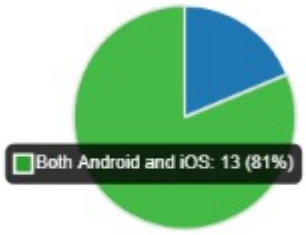
3	anonymous	Ucac
4	anonymous	University of buea - FET
5	anonymous	University of buea - FET
6	anonymous	University of buea - FET
7	anonymous	University of buea - COT
8	anonymous	University of buea - FET
9	anonymous	University of buea - FET
10	anonymous	University of buea - FET
11	anonymous	University of buea - FET
12	anonymous	University of buea - FET
13	anonymous	Was a College of Technology student
14	anonymous	UB faculty of science

81% prefers that the app should be deployed on both iOS and Android operating systems

5. **Which mobile platforms should the application be compatible with?**

Plus de détails

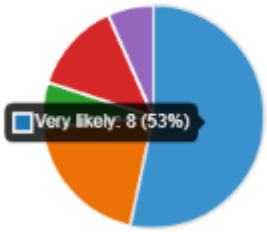
Android	3
iOS	0
Both Android and iOS	13
Autre	0



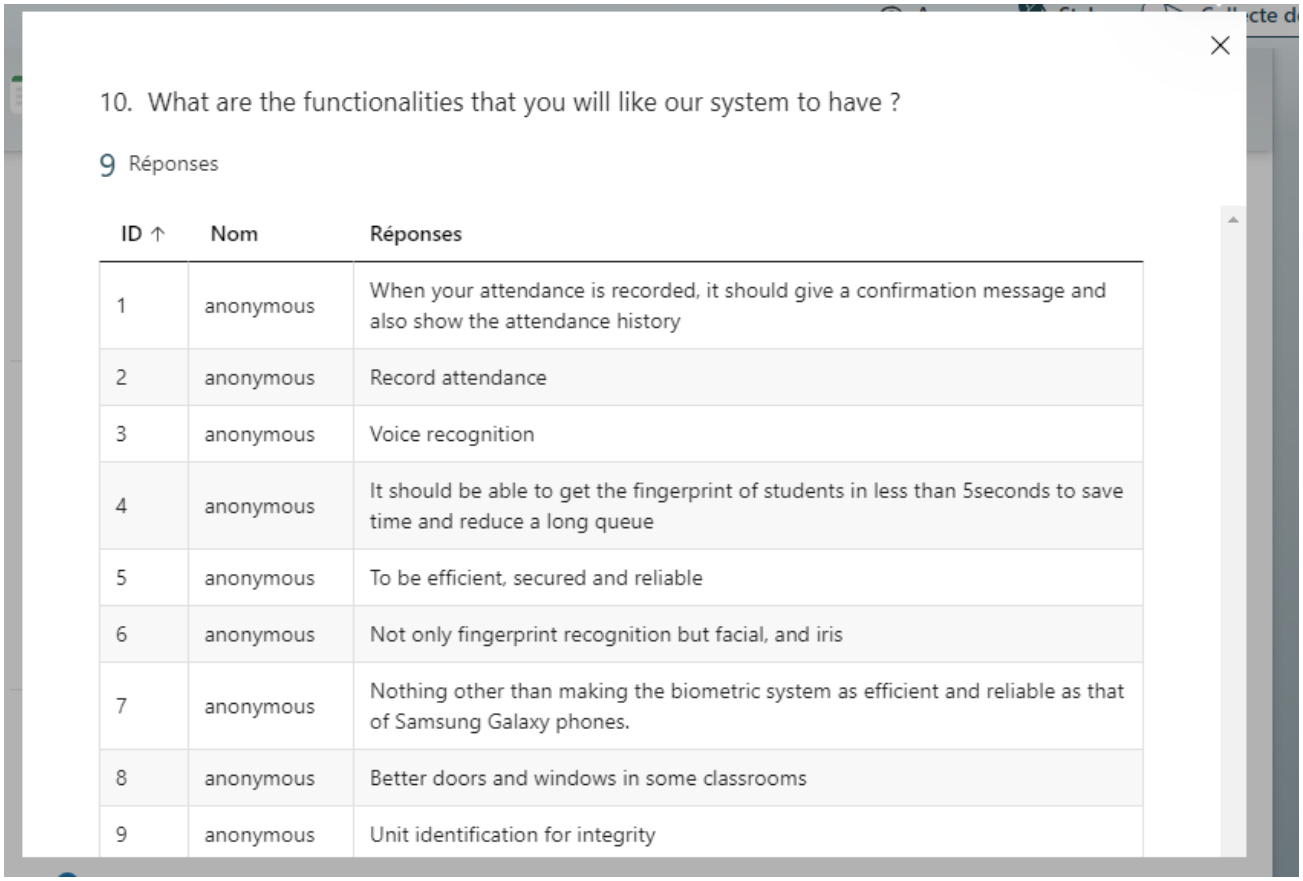
9. **How likely is your institution to adopt a Biometric Student's Attendance Mobile Application that meets your requirements?**

Plus de détails

Very likely	8
Likely	3
Neutral	1
Unlikely	2
Very Unlikely	1



Functionalities they will like the most to see in the app are shown in the following figure



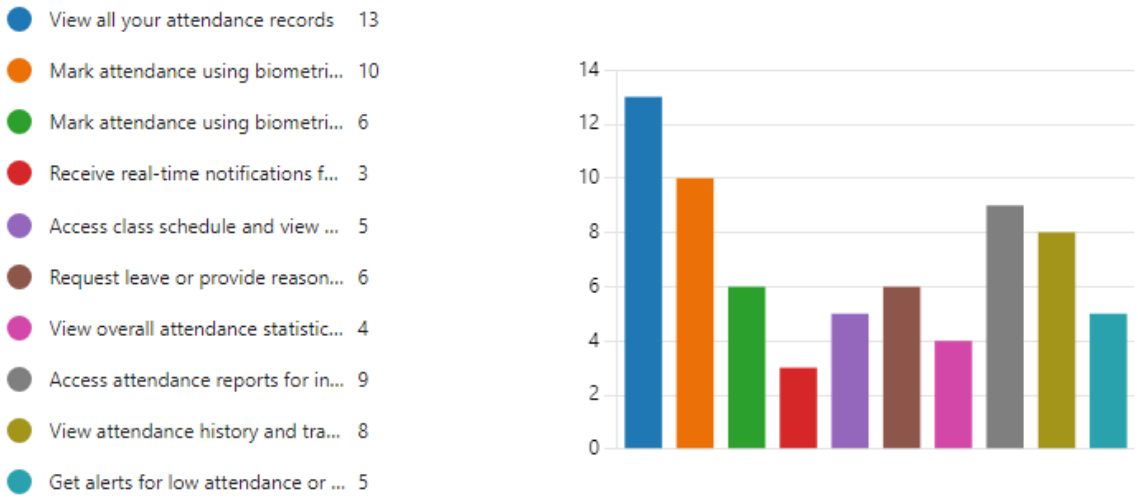
10. What are the functionalities that you will like our system to have ?

9 Réponses

ID ↑	Nom	Réponses
1	anonymous	When your attendance is recorded, it should give a confirmation message and also show the attendance history
2	anonymous	Record attendance
3	anonymous	Voice recognition
4	anonymous	It should be able to get the fingerprint of students in less than 5seconds to save time and reduce a long queue
5	anonymous	To be efficient, secured and reliable
6	anonymous	Not only fingerprint recognition but facial, and iris
7	anonymous	Nothing other than making the biometric system as efficient and reliable as that of Samsung Galaxy phones.
8	anonymous	Better doors and windows in some classrooms
9	anonymous	Unit identification for integrity

11. **Are there any additional features or requirements you would like to see / be able to do in the Biometric**

Plus de détails



4.3. Interviews:

There are one-on-one conversations with individual users or stakeholders. They allow for more in-depth discussions and provide qualitative insights. We interviewed some lecturers, and student through tools such as WhatsApp call, and face-to-face conversation, and what we got from there is as follow:

- insert into our system the timetable of the faculty
- dowload the attendance at the end of each with information such as date, time, course, level, department
- provides a system easy to use that will reduced stress
- Another method like face recognition can be more effective.
- Using tablets is less performant, instead we can use an authentication system (fingerprint) at the entry of the class.

5. Functional Requirements

Functional requirements are specific statements that describe the desired behavior, functionality, or capabilities of a software system or application. These requirements outline the tasks, services, or functions that the software should perform to meet the needs and expectations of its users. Functional requirements typically specify the inputs, processing, and outputs of the system, as well as any constraints or limitations on its behavior. They focus on what the software should do, rather than how

it should be implemented. Functional requirements serve as the basis for designing, developing, and testing software systems, ensuring that they fulfill their intended purpose and meet the desired functionality. Following are the functional requirements of our biometric student's attendance mobile application:

5.1 User management

- Student registration: The application shall allow students to register and record their fingerprint.
- Lectures registration: the system shall allow lecturers to register through the system as admin.

5.2 Attendance Marking

- Student Attendance Marking: The application shall enable students to mark their attendance securely using fingerprint recognition.

5.3 Attendance Data

- Student Attendance Viewing: Students shall be able to view their attendance record in real-time.
- Admin Attendance Access: lecturers ought to be able to access and export attendance data for their classes.

5.4 Biometric Authentication:

- The system should support fingerprint biometric authentication methods.
- The biometric authentication process should be fast (less than 5 seconds per student), accurate, and reliable.
- The system should provide feedback to students during the authentication process, indicating success or failure of account setting up.

5.5 Attendance Recording:

- The system should record the timestamp and relevant attendance information when a student successfully authenticates.
- The attendance records should be stored securely and be easily retrievable for reporting purposes.

- The system should handle multiple attendance sessions per day, such as lectures, tutorials, and labs.

6. Non-Functional Requirements (Technical requirements)

Non-functional requirements are criteria that describe qualities or attributes of a system, software application, or product, rather than its specific functionality. Here we will have to define the technical requirements of the app, including the platforms, technologies, and infrastructure that will be used including requirements for scalability, performance, and security.

The following non-functional requirements outline the desired qualities of the Biometric Student Attendance Mobile Application beyond its core functionalities:

6.1 Performance:

- Response Time: The application should provide quick feedback to user actions (e.g., registration, attendance marking) within an acceptable period (e.g., 2 seconds or less).
- Offline Functionality: The application should allow offline attendance marking. Locally stored data should synchronize with the server when an internet connection becomes available.
- Battery Consumption: The application should be optimized for low battery usage to minimize impact on mobile device battery life.

6.2Usability

- User Interface (UI): The application should have a user-friendly and intuitive UI that is easy to navigate for users with varying levels of technical ability for students.
- Accessibility: The application should follow accessibility guidelines to ensure usability for individuals with disabilities (consider factors like text size adjustment, color contrast, and screen reader compatibility).
- Localization: The application interface and content should be adaptable to different languages to accommodate a diverse user base (optional)
- The biometric authentication process should be intuitive and require minimal training for users.
- The system should provide clear and informative error messages in case of authentication failures or system errors.

6.3 Reliability

- Availability: The application should be highly available with minimal downtime to ensure students and faculty can reliably record attendance.
- Data Integrity: The application should ensure the accuracy and consistency of attendance data throughout the entire process (from marking attendance to data storage and retrieval).
- Error Handling: The application should gracefully handle errors and provide informative messages to guide the user in case of issues during registration, attendance marking, or data synchronization.

6.4 Security

- Authentication: The application should implement strong authentication mechanisms for user login (students and faculty) to prevent unauthorized access and ensure the confidentiality and integrity of student biometric data.
- Data Security: Biometric data and student information should be encrypted both at rest (on the device) and in transit (during transmission) using industry-standard encryption algorithms.
- Authorization: The application should enforce access control mechanisms to ensure that only authorized users can perform specific actions (e.g., faculty initiating attendance sessions, viewing attendance data).

6.5 Maintainability

- The application code should be well-documented, modular, and follow coding best practices to ease future maintenance and updates.
- The application should be designed to accommodate future integration with other institutional systems (e.g., student information system) if needed.

6.6 Portability

The application should be developed using a cross-platform framework or approach to ensure compatibility with different mobile operating systems (iOS, Android) with minimal code modification.

6.7 Scalability:

- The system should be able to handle a large number of students and attendance transactions without performance degradation.
- The response time for biometric authentication and attendance recording should be minimal to avoid delays (less than 5 seconds).

7. Constraints and Considerations:

- Compliance: The biometric system should adhere to any legal and regulatory requirements about the collection and usage of biometric data.
- Hardware Compatibility: The system should be compatible with a range of biometric devices and sensors available on the market.
- Integration: The system should seamlessly integrate with existing university systems, such as student information systems or learning management systems, to streamline attendance management processes.

8. Requirement documentation and Prioritization

- Functional requirements
    - User management: student registration and authentication, instructor registration, student's profile management
    - Attendance marking
    - Attendance data: student attendance view, admin attendance access
    - Biometric authentication: support fingerprint recognition, accurate and reliable (less than 5 seconds per student), system validation/prompt
- Non-functional requirements
    - Performance and scalability
    - Usability
    - Reliability
    - Security
    - Maintainability
    - Portability
- User specific requirements
    - User friendly interface.

- Ease navigation.
- Database integration.
- Notifications.

CONCLUSION

In conclusion, this report highlights the outcomes of the development of a biometric student attendance mobile application. Through a thorough requirement gathering phase that involved in-person and online interviews, surveys, and extensive research, we have successfully identified the essential needs and expectations of stakeholders. The focus of the application is to streamline the attendance tracking process in educational institutions using biometric technology, specifically fingerprint recognition. By incorporating advanced fingerprint recognition algorithms, the application aims to simplify attendance tracking, eliminate manual recording, and provide accurate and secure attendance records. The comprehensive nature of our endeavors, from stakeholder analysis to requirement elicitation and prioritization, ensures that the final application meets the specific requirements of the educational environment.